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soon ruptured and the antherozoid swims rapidly away, dragging after it the remains of the contents of the mother-cell as a very delicate vesicle (Fig. 7, *v*.)

The body of the antherozoid is coiled, the coils toward the posterior end being larger. It is generally somewhat flattened at the anterior end, where there are numerous cilia, and more or less pointed at the other, which may be drawn out into a long, delicate filament.

After the escape of the antherozoids the inner walls of the antheridium (Fig. 6) soon assume a dark brown color.

In the preparation of specimens for study, very little use was made of reagents, most of the work being done with living specimens mounted simply in water.

#### EXPLANATION OF FIGURES.

Fig 1. Small male prothallium of *Asplenium filix-femina*;  $\times 150$ . *An*, antheridia; *r*, root hair.

Figs. 2-5. Successive stages in the development of the antheridium of the same;  $\times 500$ . All except Fig. 4 in optical longitudinal section.

Fig. 6. An empty antheridium of the same;  $\times 550$ .

Fig. 7. Antherozoids of the same; *a*, before, *b*, after escaping from the mother-cells,  $\times 625$ ; *v*, vesicle:—remains of the central contents of the mother-cell.

Fig. 8. Young antheridium of *Onoclea sensibilis*. Optical section from the side;  $\times 500$ .

Fig. 9. An older one of the same species from above;  $\times 500$ .

### New American Grasses.

BY GEORGE VASEY.

ARISTIDA REVERCHONII, Vasey.—Culms slender, 1 to 2 feet high, unbranched, smooth; radical leaves 3 to 6 inches long, involute filiform, straight or curved; culm leaves about 3, rigid, erect, filiform and involute, 3 to 6 inches long; ligule a ciliate line; sheaths smooth, close, shorter than the internodes; panicle erect, spike-like, slender, 4 to 6 inches long; the branches appressed and sessile, single and alternate, the lower ones 1 to  $1\frac{1}{2}$  inches long, all closely flowered, and longer than the internodes;

glumes narrow, acute, purplish, the lower 4 lines, the upper 5 to  $5\frac{1}{2}$  lines long; flowering glume as long as the upper empty glume, or slightly longer; awns about equal, 7 to 8 lines long, spreading. Differs from *A. purpurea*, Nutt., in the narrower, denser panicle, with sessile branches, smaller flowers and shorter awns. Collected by Reverchon on rocky hills in Crocket County, Texas.

STIPA LETTERMANI, V.—Culms 1 to 2 feet high, slender; radical leaves filiform, 4 to 6 inches long; ligule short; panicle spike-like, narrow, slender, 4 to 6 inches long, loose; lower rays 1 to  $1\frac{1}{2}$  inches long, erect, mostly single, sparsely flowering nearly to the base, upper branches shorter; outer glumes about 3 lines long, acuminate and awn pointed, both three-nerved; flowering glume about 2 lines long, sparsely pubescent, the hairs long near the summit, awn bent, 6 to 8 lines long. One of the smallest flowered species; collected in Idaho by Prof. G. W. Letterman.

MUHLENBERGIA PARISHII, V.—This species was described in the Bot. Gazette, for August and September, 1882, page 93, as *M. sylvatica*, var. *Californica*. I am now satisfied that it is a good species and name it for the collector, Mr. S. B. Parish, of San Bernardino. Cal.

MUHLENBERGIA CALIFORNICA, V.—This was described, on page 92 of the same number of the Bot. Gazette, as *M. glomerata*, var. *brevifolia*. It is sufficiently distinct to constitute a good species.

MUHLENBERGIA WRIGHTII, V.—Culms erect or decumbent, usually branching below, 1 to  $2\frac{1}{2}$  feet high, somewhat compressed, rather wiry; leaves short and somewhat stiff, 3 to 6 inches long; sheaths smoothish, shorter than the internodes, ligule short; panicle spike-like, cylindrical, densely flowered, more or less interrupted; the lower branches are, on thrifty specimens,  $\frac{1}{2}$  to 1 inch long, appressed and floriferous to the base; spikelets frequently two-flowered; outer glumes nearly equal, about 1 line long, with a thin ovate base, and an awned point as long or longer, or sometimes lanceolate with a shorter point; flowering glume a little longer and thicker than the outer ones, tipped with a short, stiff awn,  $\frac{1}{3}$  to  $\frac{1}{2}$  line long, three-nerved below, slightly pubescent; the palea about as long as its glume.

Throughout the Rocky Mountain region. It is No. 1986, C. Wright; 806, M. E. Jones; 3177, J. G. Lemmon, etc. Mr. Lemmon found a form which he says grows in ring-like patches.

*AGROSTIS DEPRESSA*, V.—Culms decumbent and geniculate at the base, becoming erect, 6 to 10 inches high, slender, leafy below; leaves short and narrow, plain, 1 to 2 inches long,  $\frac{1}{2}$  line wide, acute; ligule conspicuous, about 1 line long, obtuse and ciliate at apex; sheaths smooth, striate, the lower ones loose; panicle narrow, 1 to 2 inches long, or in age broader and more spreading; the branches short, variable in number, 2 to 5 at the lower joints and unequal; pedicels scabrous, about as long as the spikelets; empty glumes nearly equal, about 1 line long, ovate-lanceolate, acute, roughish on the keel above; flowering glume one-third shorter, narrowly oblong, obtuse or minutely dentate at the apex; palet narrow, half as long as its glume. Collected in Clear Creek Canon, Col., by H. N. Patterson, 1885.

*AGROSTIS EXARATA*, var. *STOLONIFERA*, V.—Cæspitose; culms 8 to 12 inches high from a decumbent base, with numerous short leaves, which are seldom more than an inch long, narrow, acuminate; the radical leaves also short and abundant; ligule membranaceous, conspicuous, obtuse; panicle  $1\frac{1}{2}$  to 2 inches long, purplish, narrow; branches very short and clustered, mostly flowering to the base, some of the lowest longer and naked below; spikelets about 1 line long, sometimes two-flowered; empty glumes nearly equal, acute, hispid on the keel; flowering glumes one-third shorter, oblong ovate, toothed at the apex, sometimes with a short awn, palet small, equaling the ovary; long leafy stolons, sometimes a foot long, are often emitted from the base, the joints 1 to 2 inches apart. Bottom lands of the Columbia River, collected by Mr. W. N. Suksdorf. Perhaps a good species.

*AGROSTIS EXARATA*, var. *LITTORALIS*, V.—Culms erect from a creeping rhizome, 10 to 16 inches high, stout, with about four nodes; leaves erect or appressed, rather rigid, the upper one near the panicle, varying from 2 to 4 inches long, about 1 line wide below, narrowed to a long point, scabrous on the margins, ligule conspicuous, obtuse, membranaceous; panicle rigidly erect, narrow, lanceolate, densely flowered, the branches un-

equal and numerous, the shorter floriferous to the base, the lower ones (about  $\frac{1}{2}$  inch) nearly so; spikelets about  $1\frac{1}{2}$  lines long, empty glumes lanceolate, acute, membraneous on the margins; flowering glumes one-third shorter, oblong, obtuse, obscurely five-nerved; palet wanting; stamens three.

Found by Mr. T. J. Howell on the sandy seashore in Oregon. It differs much from the ordinary form of *A. exarata*, and perhaps should be considered a distinct species.

AGROSTIS FOLIOSA, V.—Culms  $1\frac{1}{2}$  feet high, erect, smooth; culm leaves four or five, erect, somewhat rigid, 4 to 6 inches long,  $1\frac{1}{2}$  to 2 lines wide, long pointed; ligule about 2 lines long, lacerate at apex; panicle 4 to 5 inches long, open and loose, the lower branches mostly in fives, unequal, the lower 1 inch long or more, somewhat spreading, capillary, rather few flowered, mostly naked below; spikelets little more than 1 line long, lanceolate, abruptly acute; flowering glume nearly as long as the outer ones, five-nerved, obtuse and shortly four or five-toothed at apex; palet wanting. Collected in Oregon by T. J. Howell. The panicle much like a short branched *A. alba*.

AGROSTIS DIEGOENSIS, V.—Culms erect, stout, 2 to 3 feet or more high, smooth; leaves 4 to 7 inches long, 1 to 2 lines wide, erect, those of the culm with long sheaths (the upper ones 8 or 9 inches long); ligule about 2 lines long, acute; panicle 6 to 8 inches long, lanceolate, the joints rather distant (the lower  $1\frac{1}{2}$  to 2 inches); branches numerous, unequal, erect, the longer ones about two inches long, and floriferous above the middle, the shorter floriferous to the base, the flowers numerous; spikelets light green,  $1\frac{1}{2}$  to 2 lines long, outer glumes acute, scabrous on the keel; flowering glume one-third shorter, oblong, obtuse, the mid-nerve terminating about the middle, with or without a minute awn; palet none. Collected at San Diego, California, by C. R. Orcutt. The panicle resembles that of *A. alba*, but is narrower, stouter and more closely flowered.

AGROSTIS OREGONENSIS, V.—Root fibrous (annual?); culms about 2 feet high, somewhat slender, radical leaves filiform; culm leaves distant, narrow, soon tapering to a long, slender point, 3 to 4 inches long; ligule short; panicle 4 to 5 inches long, nodding and flexuous, open but not spreading; branches

capillary, unequal, mostly in fives below, above in twos or threes, the longer about 2 inches long, all naked below, and rather numerous flowered above; pedicels slender, as long as, to two or three times as long as, the spikelets, which are about  $1\frac{1}{2}$  lines long, narrowly lanceolate, and gradually tapering to the acute point, slightly scabrous on the keel, rather thin and purple; flowering glume a little shorter than the empty ones, narrowly lanceolate, five-nerved, apex rather obtuse; palet wanting. The panicle has a rich purple color, and it approaches the *A. scabra*, but is shorter, and with much shorter and erect branches, and a firmer culm. Collected in Oregon by Mr. Howell.

DEYEUXIA CUSICKII, V.—Culms from a strong creeping rhizome, stout, smooth, 4 feet high, radical leaves abundant, a foot long and 2 lines wide, tapering to a long point; culm leaves three or four, distant, long and wide like the radical ones; sheaths shorter than the internodes, smooth, striate, 4 to 8 inches long; ligule decurrent, thin, about 2 lines long, lanceolate at the apex; panicle 6 to 7 inches long, 1 inch or more wide, erect, the lower joints 1 inch apart; branches numerous, verticillate, mostly flowering to the base, the longer ones  $1\frac{1}{2}$  inches long, and naked below; empty glumes lanceolate, smooth, rather thin, about 2 lines long, strongly acute or acuminate, the lower one-nerved, upper three-nerved, and a little shorter; flowering glume nearly equaling the empty ones, narrowly lanceolate acuminate, smooth, thinnish, five-nerved, bifid at the apex, awn erect, inserted a little below the middle, slightly longer than its glume, hairs scanty, about half as long as the glume; palet nearly equaling its glume, thin, membranous.

A showy grass, with abundant foliage and rather ample panicle, collected in eastern Oregon at an altitude of 5,000 feet, by Mr. W. C. Cusick, who states that the radical shoots are abundant, but rarely sending up flowering culms.

### Turner's New Desmids of the United States.

BY FRANCIS WOLLE.

It is with a feeling of much satisfaction that I have been observing the growing interest in the study of the Desmids, not only of foreign countries, but especially of the United States, and